

Application No. 09/970,294
Amendment dated October 7, 2004
Reply to Office Action of July 13, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-90. (cancelled)

91. (currently amended) A screw for use in the human body formed of cortical bone from a major long bone having a medullary canal, said screw comprising a leading end, a trailing end opposite said leading end, and a shaft therebetween, said shaft having a mid-longitudinal axis, a length, and a thread extending from said shaft along at least a portion of its length, said shaft having a cross section transverse to said mid-longitudinal axis through said thread having a concavely arcuate portion and a ~~convexedly~~convexedly arcuate portion opposite said concavely arcuate portion, said concavely arcuate portion being formed from at least a portion of the medullary canal, said cross section bisecting a rotation of said thread.
92. (original) The screw of claim 91, wherein said cross section has opposite convex portions with approximately the same radius, said concavely arcuate portion and said convexedly arcuate portion being between said opposite convex portions, said convexedly arcuate portion having a radius greater than the radius of said opposite convex portions, said cross section being through said concavely arcuate portion of said thread.
93. (original) The screw of claim 91, wherein said trailing end is configured to cooperatively engage at least a portion of the screw hole of an implant so as to prevent said screw from linear motion along the mid-longitudinal axis of said shaft in a direction opposite to the direction of insertion when said screw is threaded through a screw hole to attach the implant to a bone portion of the human body.

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94. (original) The screw of claim 91, wherein said screw is formed substantially of cortical bone of a single cortical thickness.
95. (previously presented) The screw of claim 91, further comprising an enlarged portion proximate said trailing end with a dimension transverse to the mid-longitudinal axis of said shaft greater than an outer diameter of said thread, said enlarged portion configured to prevent said trailing end from passing through the screw hole in the implant.
96. (original) The screw of claim 95, wherein said enlarged portion forms a head.
97. (original) The screw of claim 95, wherein said enlarged portion forms a lip.
98. (previously presented) The screw of claim 91, wherein said trailing end includes a second thread having a different thread pitch than said thread along said shaft.
99. (original) The screw of claim 98, wherein the thread pitch of said second thread is similar to a metal screw pitch.
100. (original) The screw of claim 98, wherein the thread pitch of said thread along said shaft is similar to a wood screw pitch
101. (previously presented) The screw of claim 91, wherein the thread pitch of said thread along said shaft is similar to a wood screw pitch.
102. (previously presented) The screw of claim 91, wherein at least a portion of said trailing end is expandable.
103. (original) The screw of claim 102, wherein at least a portion of said trailing end is divided into at least two members with an opening therebetween.
104. (original) The screw of claim 103, further comprising an insert configured to fit into said opening of said trailing end and to move said at least two members apart when inserted into said opening.
105. (original) The screw of claim 104, wherein said insert is configured to be inserted by linear advancement into said opening.
106. (original) The screw of claim 105, wherein said insert has a cruciate shape and said opening has a corresponding cruciate shape.

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107. (original) The screw of claim 104, wherein said insert is configured to be inserted by rotational movement into said opening.
108. (original) The screw of claim 107, wherein said insert is threaded.
109. (previously presented) The screw of claim 91, wherein at least a portion of said trailing end is configured to cooperatively engage a driving instrument for insertion of said screw.
110. (original) The screw of claim 109, wherein said trailing end includes a recess to cooperatively engage a driving instrument.
111. (original) The screw of claim 110, wherein said recess is one of cruciate-shape and hex-shaped.
112. (original) The screw of claim 109, wherein said trailing end includes a protrusion to cooperatively engage a driving instrument.
113. (original) The screw of claim 112, wherein said protrusion has a hex-shaped perimeter.
114. (previously presented) The screw of claim 91, wherein said thread is sharper proximate said leading end than proximate said trailing end.
115. (previously presented) The screw of claim 91, wherein said thread has a V-shaped cross section with an apex and a base adjacent to said shaft, said base being substantially wider than said apex.
116. (previously presented) The screw of claim 91, wherein said thread has a peak as measured from said shaft, the peak being greater proximate said leading end than said trailing end.
117. (previously presented) The screw of claim 91, wherein said shaft has a root diameter that increases in the direction from said leading end to said trailing end.
118. (previously presented) The screw of claim 91, wherein said leading end forms a tip and said tip is fluted.
119. (original) The screw of claim 94, wherein said cortical bone is obtained from a human.

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120. (original) The screw of claim 94, wherein said cortical bone is obtained from a generally intramembraneously formed cortical bone.
121. (original) The screw of claim 94, wherein said cortical bone is obtained from a large tubular bone of a human.
122. (original) The screw of claim 121, wherein said cortical bone is from the diaphyseal region of said large tubular bone.
123. (original) The screw of claim 121, wherein the tubular bone is a femur.
124. (previously presented) The screw of claim 91, further comprising a bioresorbable material other than cortical bone.
125. (original) The screw of claim 124, wherein said material includes bioresorbable plastics.
126. (previously presented) The screw of claim 124, wherein said material includes at least one of glycolide polymers, lactide, caprolactone, trimethylene carbonate, and dioxanone.
127. (previously presented) The screw of claim 91, wherein said screw comprises bone growth promoting material.
128. (original) The screw of claim 127, wherein said bone growth promoting material is selected from one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
129. (previously presented) The screw of claim 91, wherein said screw is treated with a bone growth promoting substance.
130. (currently amended) A screw formed from a major long bone having a medullary canal, said screw comprising a leading end, a trailing end opposite said leading end, and a shaft therebetween, said shaft having a mid-longitudinal axis, a length, and a thread extending from said shaft along at least a portion of its length, said shaft having a cross section transverse to said mid-longitudinal axis through said thread having a concavely arcuate portion and a ~~convexly~~convexedly arcuate portion opposite said concavely arcuate portion, said concavely arcuate portion being formed from at least a portion of the

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- medullary canal, said cross section bisecting a rotation of said thread, said screw being formed by the process of cutting a strip of cortical bone having a single cortical thickness from the long bone in the direction of the longitudinal axis of the long bone and machining said strip to form a thread.
131. (original) The screw of claim 130, wherein said strip of cortical bone is cut with a trephine having a diameter greater than the cortical thickness of the long bone.
132. (original) The screw of claim 131, wherein said cross section has opposite convex portions with approximately the same radius, said concavely arcuate portion and said convexly arcuate portion being between said opposite convex portions, said convexly arcuate portion having a radius greater than the radius of said opposite convex portions, said cross section being through said concavely arcuate portion of said thread.
133. (currently amended) A method for forming a screw made of cortical bone, comprising the steps of:
- cutting a strip of cortical bone having a single cortical thickness from a long bone in the direction of the longitudinal axis of the long bone; and
 - machining said strip to form a screw having a shaft with a mid-longitudinal axis, a length, and a thread extending from said shaft along at least a portion of its length, said shaft having a cross section transverse to said mid-longitudinal axis through said thread having a concavely arcuate portion and a ~~convexly~~convexly arcuate portion opposite said concavely arcuate portion, said cross section bisecting a rotation of said thread.
134. (original) The method of claim 133, wherein the cutting step includes the sub-step of using a trephine having a diameter greater than the cortical thickness of the long bone.
135. (original) The method of claim 134, wherein the machining step includes the sub-steps of forming said cross section with opposite convex portions having approximately the same radius, said concavely arcuate portion and said convexly arcuate portion being between said opposite convex portions, said

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convexedly arcuate portion having a radius greater than the radius of said opposite convex portions, said cross section being through said concavely arcuate portion of said thread.

Claims 136-138. (cancelled)

139. (previously presented) The screw of claim 91, in combination with a bone growth promoting material.
140. (previously presented) The screw of claim 139, wherein said bone growth promoting material includes at least one of bone morphogenetic protein, mineralizing proteins, hydroxyapatite, and genetic material coding for the production of bone.
141. (previously presented) The screw of claim 130, in combination with a bone growth promoting material.
142. (previously presented) The screw of claim 141, wherein said bone growth promoting material includes at least one of bone morphogenetic protein, mineralizing proteins, hydroxyapatite, and genetic material coding for the production of bone.
143. (previously presented) The method of claim 133, further comprising the step of coating the screw with at least one of bone morphogenetic protein, mineralizing proteins, hydroxyapatite, and genetic material coding for the production of bone.
144. (original) The screw of claim 91, in combination with an instrument for inserting said screw.
145. (original) The screw of claim 130, in combination with an instrument for inserting said screw.
146. (previously presented) The screw of claim 91, wherein said thread has a plurality of turns, a majority of said turns including said concavely arcuate portion.
147. (previously presented) The screw of claim 146, wherein all of said turns include said concavely arcuate portion.
148. (previously presented) The screw of claim 146, wherein the radii of at least two of said concavely arcuate portions vary along the length of said shaft.

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149. (previously presented) The screw of claim 91, wherein said thread has an outer diameter that is generally constant along the length of said shaft.
150. (previously presented) The screw of claim 130, wherein said thread has a plurality of turns, a majority of said turns including said concavely arcuate portion.
151. (previously presented) The screw of claim 150, wherein all of said turns include said concavely arcuate portion.
152. (previously presented) The screw of claim 150, wherein the radii of at least two of said concavely arcuate portions vary along the length of said shaft.
153. (previously presented) The screw of claim 130, wherein said thread has an outer diameter that is generally constant along the length of said shaft.
154. (currently amended) A screw for use in the human body formed of cortical bone from a major long bone having a medullary canal ~~for use in the human body~~, said screw comprising:
- a leading end and a trailing end opposite said leading end;
 - a shaft between said leading and trailing ends, said shaft having a mid-longitudinal axis, a length, and a thread extending from said shaft along at least a portion of its length, said thread having an outer diameter, said shaft having a cross section transverse to the mid-longitudinal axis through said thread having a concavely arcuate portion and a ~~convexedly~~ convexedly arcuate portion opposite said concavely arcuate portion, said concavely arcuate portion being formed from at least a portion of the medullary canal, said cross section bisecting a rotation of said thread; and
 - an enlarged portion proximate said trailing end with a dimension transverse to the mid-longitudinal axis of said shaft greater than the outer diameter of said thread, said enlarged portion configured to prevent said trailing end from passing through ~~at the~~ screw hole in ~~an~~ the implant, said enlarged portion including a concavely arcuate portion formed from at least a portion of the

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~~medullary canal in said cross section transverse to the mid-longitudinal axis of said shaft.~~

155. (previously presented) The screw of claim 154, wherein said cross section has opposite convex portions with approximately the same radius, said concavely arcuate portion and said convexedly arcuate portion being between said opposite convex portions, said convexedly arcuate portion having a radius greater than the radius of said opposite convex portions, said cross section being through said concavely arcuate portion of said thread.
156. (currently amended) The screw of claim 154, wherein said trailing end is configured to cooperatively engage at least a portion of the screw hole of thean implant so as to prevent said screw from linear motion along the mid-longitudinal axis of said shaft in a direction opposite to the direction of insertion when said screw is threaded through thea screw hole to attach the implant to a bone portion of the human body.
157. (previously presented) The screw of claim 154, wherein said screw is formed substantially of cortical bone of a single cortical thickness.
158. (withdrawn) The screw of claim 154, wherein said enlarged portion forms a head.
159. (previously presented) The screw of claim 154, wherein said enlarged portion forms a lip.
160. (previously presented) The screw of claim 154, wherein the thread pitch of said thread along said shaft is similar to a wood screw pitch.
161. (previously presented) The screw of claim 154, wherein at least a portion of said trailing end is configured to cooperatively engage a driving instrument for insertion of said screw.
162. (previously presented) The screw of claim 161, wherein said trailing end includes a recess to cooperatively engage a driving instrument.
163. (previously presented) The screw of claim 154, wherein said thread is sharper proximate said leading end than proximate said trailing end.

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164. (previously presented) The screw of claim 154, wherein said thread has a V-shaped cross section with an apex and a base adjacent to said shaft, said base being substantially wider than said apex.
165. (withdrawn) The screw of claim 154, wherein said thread has a peak as measured from said shaft, the peak being greater proximate said leading end than said trailing end.
166. (withdrawn) The screw of claim 154, wherein said shaft has a root diameter that increases in the direction from said leading end to said trailing end.
167. (previously presented) The screw of claim 154, wherein said leading end forms a tip and said tip is fluted.
168. (previously presented) The screw of claim 157, wherein said cortical bone is obtained from a human.
169. (previously presented) The screw of claim 157, wherein said cortical bone is obtained from a generally intramembraneously formed cortical bone.
170. (previously presented) The screw of claim 157, wherein said cortical bone is obtained from a large tubular bone of a human.
171. (previously presented) The screw of claim 170, wherein said cortical bone is from the diaphyseal region of said large tubular bone.
172. (previously presented) The screw of claim 170, wherein the tubular bone is a femur.
173. (previously presented) The screw of claim 154, further comprising a bioresorbable material other than cortical bone.
174. (previously presented) The screw of claim 173, wherein said material includes bioresorbable plastics.
175. (previously presented) The screw of claim 173, wherein said material includes at least one of glycolide polymers, lactide, caprolactone, trimethylene carbonate, and dioxanone.
176. (previously presented) The screw of claim 154, wherein said screw is treated with a bone growth promoting substance.

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177. (previously presented) The screw of claim 154, in combination with a bone growth promoting material.
178. (previously presented) The screw of claim 177, wherein said bone growth promoting material includes at least one of bone morphogenetic protein, mineralizing proteins, hydroxyapatite, and genetic material coding for the production of bone.
179. (previously presented) The screw of claim 154, in combination with an instrument for inserting said screw.
180. (previously presented) The screw of claim 154, wherein said thread has a plurality of turns, a majority of said turns including said concavely arcuate portion.
181. (previously presented) The screw of claim 180, wherein all of said turns include said concavely arcuate portion.
182. (previously presented) The screw of claim 180, wherein the radii of at least two of said concavely arcuate portions vary along the length of said shaft.
183. (previously presented) The screw of claim 154, wherein said thread has an outer diameter that is generally constant along the length of said shaft.
184. (currently amended) A screw formed of cortical bone for use in the human body, said screw comprising a leading end, a trailing end opposite said leading end, and a shaft therebetween, said shaft having a mid-longitudinal axis, a length, and a thread extending from said shaft along at least a portion of its length, said shaft having a cross section transverse to said mid-longitudinal axis through said thread having a concavely arcuate portion and a ~~convexedly~~convexedly arcuate portion opposite said concavely arcuate portion, said cross section having opposite convex portions with approximately the same radius, said concavely arcuate portion and said convexedly arcuate portion being between said opposite convex portions, said convexedly arcuate portion having a radius greater than the radius of said opposite convex portions, said cross section

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- bisecting a rotation of said thread and being through said concavely arcuate portion of said thread.
185. (currently amended) The screw of claim 184, wherein said trailing end is configured to cooperatively engage at least a portion of ~~the~~ screw hole of an implant so as to prevent said screw from linear motion along the mid-longitudinal axis of said shaft in a direction opposite to the direction of insertion when said screw is threaded through a screw hole to attach the implant to a bone portion of the human body.
186. (previously presented) The screw of claim 184, wherein said screw is formed substantially of cortical bone of a single cortical thickness.
187. (previously presented) The screw of claim 184, wherein at least a portion of said trailing end is configured to cooperatively engage a driving instrument for insertion of said screw.
188. (previously presented) The screw of claim 184, further comprising a bioresorbable material other than cortical bone.
189. (previously presented) The screw of claim 188, wherein said material includes bioresorbable plastics.
190. (previously presented) The screw of claim 188, wherein said material includes at least one of glycolide polymers, lactide, caprolactone, trimethylene carbonate, and dioxanone.
191. (previously presented) The screw of claim 184, wherein said screw comprises bone growth promoting material.
192. (previously presented) The screw of claim 191, wherein said bone growth promoting material is selected from one of bone morphogenetic protein, hydroxyapatite, and genes coding for the production of bone.
193. (previously presented) The screw of claim 184, wherein said screw is treated with a bone growth promoting substance.
194. (currently amended) A screw comprising a leading end, a trailing end opposite said leading end, and a shaft therebetween, said shaft having a mid-longitudinal

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axis, a length, and a thread extending from said shaft along at least a portion of its length, said shaft having a cross section transverse to said mid-longitudinal axis through said thread having a concavely arcuate portion and a ~~convexedly~~convexedly arcuate portion opposite said concavely arcuate portion, said cross section having opposite convex portions with approximately the same radius, said concavely arcuate portion and said convexedly arcuate portion being between said opposite convex portions, said convexedly arcuate portion having a radius greater than the radius of said opposite convex portions, said cross section bisecting a rotation of said thread and being through said concavely arcuate portion of said thread, said screw being formed by the process of cutting a strip of cortical bone having a single cortical thickness from a long bone in the direction of the longitudinal axis of the long bone and machining said strip to form a thread.

195. (previously presented) The screw of claim 194, wherein said strip of cortical bone is cut with a trephine having a diameter greater than the cortical thickness of the long bone.
196. (previously presented) The screw of claim 194, in combination with a bone growth promoting material.
197. (previously presented) The screw of claim 196, wherein said bone growth promoting material includes at least one of bone morphogenetic protein, mineralizing proteins, hydroxyapatite, and genetic material coding for the production of bone.
198. (previously presented) The screw of claim 194, in combination with an instrument for inserting said screw.
199. (previously presented) The screw of claim 194, wherein said thread has a plurality of turns, a majority of said turns including said concavely arcuate portion.
200. (previously presented) The screw of claim 199, wherein all of said turns include said concavely arcuate portion.

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201. (previously presented) The screw of claim 199, wherein the radii of at least two of said concavely arcuate portions vary along the length of said shaft.
202. (previously presented) The screw of claim 194, wherein said thread has an outer diameter that is generally constant along the length of said shaft.